2.3: Business Applications Using Quadratics

Recall the following:

Definition.
Profit is the difference between the revenue and total cost:

$$P(x) = R(x) - C(x)$$

where

$$\begin{aligned} P(x) &= \text{profit from sale of } x \text{ units}, \\ R(x) &= \text{total revenue from sale of } x \text{ units}, \\ C(x) &= \text{total cost from production and sale of } x \text{ units}. \end{aligned}$$

In general, **total revenue** is

$$\text{Revenue} = (\text{price per unit})(\text{number of units})$$

The **total cost** is composed of fixed cost and variable cost:

- **Fixed costs** (FC) remain constant regardless of the number of units produced.
- **Variable costs** (VC) are directly related to the number of units produced.

The total cost is given by

$$\text{Cost} = \text{variable costs} + \text{fixed costs}$$

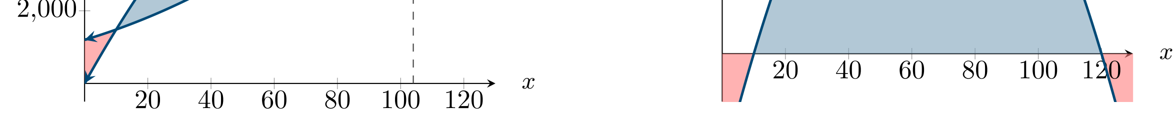
Example. Suppose that a company's cost include a fixed cost of $\$1,200$, and a variable cost per unit of $\frac{x}{4} + 18$ dollars, where x is the total number of units produced. If the selling price of their product is $(156 - \frac{3x}{4})$ dollars per unit, then

How many units should be sold to maximize the revenue?

Find the profit function.

How many units should be sold to maximize the profit?

Find the **break-even point** (e.g. where $R(x) = C(x)$ and $P(x) = 0$).



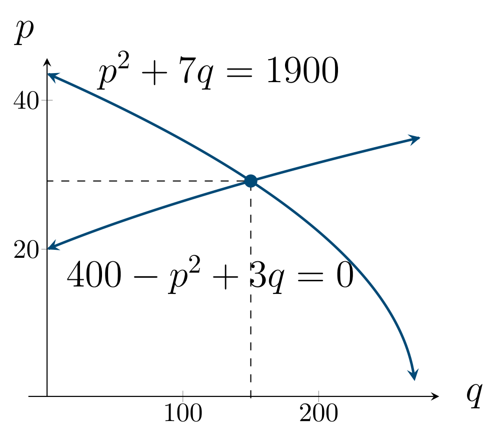
Example. Suppose that the demand function for a commodity is given by the equation

$$p^2 + 7q = 1900,$$

and the supply function is given by the equation

$$400 - p^2 + 3q = 0.$$

Find the **market equilibrium**



Example. If the supply and demand functions for a commodity are given by $p - q = 10$ and $q(2p - 10) = 2100$, what is the equilibrium price and what is the corresponding number of units supplied and demanded?